

**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
(Chapter II of the Patent Cooperation Treaty)  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference Cal 88988	<b>FOR FURTHER ACTION</b> See Form PCT/IPEA/416	
International application No. PCT/EP2004/014166	International filing date (day/month/year) 13.12.2004	Priority date (day/month/year) 22.12.2003
<p>International Patent Classification (IPC) or national classification and IPC INV. C07C7/04 C07C2/66 C07C5/333</p> <p>Applicant POLIMERI EUROPA S.P.A.</p>		
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input type="checkbox"/> <i>(sent to the applicant and to the International Bureau)</i> a total of sheets, as follows:</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</li> <li><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</li> </ul> <p>b. <input type="checkbox"/> <i>(sent to the International Bureau only)</i> a total of (indicate type and number of electronic carrier(s)), containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> <p>4. This report contains indications relating to the following items:</p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Box No. I Basis of the report</li> <li><input type="checkbox"/> Box No. II Priority</li> <li><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</li> <li><input type="checkbox"/> Box No. IV Lack of unity of invention</li> <li><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</li> <li><input type="checkbox"/> Box No. VI Certain documents cited</li> <li><input type="checkbox"/> Box No. VII Certain defects in the international application</li> <li><input type="checkbox"/> Box No. VIII Certain observations on the international application</li> </ul>		
Date of submission of the demand 21.06.2005	Date of completion of this report 17.05.2006	
Name and mailing address of the international preliminary examining authority:   European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized officer  O'Sullivan, P Telephone No. +31 70 340-4511	



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International application No.  
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**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on
  - the international application in the language in which it was filed
  - a translation of the international application into , which is the language of a translation furnished for the purposes of:
    - international search (under Rules 12.3(a) and 23.1(b))
    - publication of the international application (under Rule 12.4(a))
    - international preliminary examination (under Rules 55.2(a) and/or 55.3(a))
2. With regard to the **elements\*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

**Description, Pages**

1-17 as originally filed

**Claims, Numbers**

1-13 as originally filed

**Drawings, Sheets**

1 as originally filed

a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3.  The amendments have resulted in the cancellation of:
  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):
4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
  - the description, pages
  - the claims, Nos.
  - the drawings, sheets/figs
  - the sequence listing (*specify*):
  - any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

Novelty (N)	Yes: Claims	1-13
	No: Claims	
Inventive step (IS)	Yes: Claims	1-13
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-13
	No: Claims	

**2. Citations and explanations (Rule 70.7):**

**see separate sheet**

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AP3 Rec'd PCT/PTO 19 JUN 2005

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Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Reference is made to the following documents:

D1: US-A-3 408 265 (WARD DENNIS J) 29 October 1968 (1968-10-29)

D2: DE 29 14 226 A (COSDEN TECHNOLOGY) 23 October 1980 (1980-10-23)

**Novelty**

The document D1 discloses (D1, column 2, lines 24-57; column 4, lines 4-37) a method for separating ethylbenzene and styrene which comprises introducing said mixture into a distillation zone maintained under distillation conditions, withdrawing an overhead stream comprising ethylbenzene, withdrawing styrene as a side-cut vapour fraction, and introducing relatively non-volatiles hydrocarbons into said zone, said hydrocarbons comprising a cut-back oil which may be any non-volatile hydrocarbon, such as tetraethylbenzene. D1 does not disclose steps a), b) and c) of present claims 1 nor does it disclose step f), namely the feeding of the fourth stream of step c), i.e. the polyalkylated aromatic hydrocarbons, to a distillation column of step e). The subject-matter of present claims 1-13 is therefore novel over D1.

**Inventive Step**

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1-13 does not involve an inventive step in the sense of Article 33(3) PCT.

The document D1 (see description of disclosure above) is regarded as being the closest prior art to the subject-matter of claim 1. The problem underlying the present application may be formulated as provision of an alternative process for the purification of styrene. The production of ethylbenzene via steps a), b) and c) of present claim 1 constitute the standard method of obtaining this product and is well known by the skilled person. The skilled person knows from the teaching of D1 that the addition of 'relatively non-volatile

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hydrocarbon oil' such as tetraethylbenzene in the distillation column for the separation of ethylbenzene and styrene leads to a reduction in polymerization of styrene (D1, column 3, lines 4-8). However, tetraethylbenzene cannot be considered equivalent to the bottom product of the alkylation section which may comprise many products besides tetraethylbenzenes such as tetralines or alkyl substituted diphenyl ethanes (see application page 9, lines 1-5). It is therefore not considered evident in the light of D1 for the skilled person to take the bottoms product of the alkylation step to as a source of alternative non-volatile hydrocarbon oil in the distillation column. Claims 1-13 are therefore considered inventive.

**Miscellaneous**

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.